

viti-notes

[understanding
grapevine growth]



Research *to* Practice

Site factors influencing berry ripening processes and rates of ripening

Viti-note Summary:

- The influence of site characteristics
- Rates of ripening
- How to assess ripening patterns
- Managing ripening rates



Figure 1. Vineyard in autumn. (Image courtesy of P.R. Dry)

Other topics in this Viti-Notes series include:

- Bud dormancy and budburst
- Spring shoot growth
- Flowering and pollination
- Berry development - up to veraison
- Berry development - Ripening
- Defining berry ripeness
- *Site factors influencing berry ripening processes and rates of ripening*
- Restricted Spring Growth syndrome

On the same site, with identical cultural practices, different grapevine varieties generally ripen at different rates. This is due to the genetically-determined behaviours of the grape varieties, in combination with their interaction with the site. Correct variety selection for a particular site will ensure that vine and berry development will be in phase with the climate and other aspects of the vineyard environment.

Good varietal selection is important if critical stages of development are to occur during favourable conditions. Unfavourable conditions include being too:

- Cold in the four weeks before harvest;
- Hot in the two months before harvest;
- Wet before harvest, thus increasing bunch rot risk.

The influence of site characteristics

The viticulturally-important aspects of a site comprise the soil, water and atmospheric environment (light, temperature and moisture elements):

- Soil physical and chemical properties influence water availability and nutrient supply;
- The amount and quality of water available to vines can impact strongly on vigour and stress behaviour;
- Water chemistry can impact on nutrient uptake by vines, including the accumulation of toxic elements such as salts and some metals;
- Sunlight is generally available at sufficient levels for effective photosynthesis in Australian vineyards; however, in some regions or seasons, extreme cloud cover alone, or in combination with unfavorable canopy

architecture or row orientation can result in severe shading which can limit fruit set, sugar accumulation and flavour development;

- Temperature ranges at various points in the season impact on ripening. The effects of cold are well established, but potentially important also is the 'heat load' which may apply in unseasonably hot weather during berry development;
- The timing of, frequency and persistence of rain, mists or dew also play a role in berry ripening.

French viticulturists use the term 'terroir' for the combination of climate, soil and other characteristics of site.

Rates of ripening

Moderate rather than excessively high temperatures tend to result in fast sugar ripening. In cool climate regions, fast ripening can occur in warm seasons, or can result from management practices which increase exposure and lower water availability.

Excessively slow ripening can result in grapes nearing maturity when weather conditions in some regions may be unstable. In cool climates, maturing grapes may be affected by cold or be in danger of damage by hail or wind in late season storms, thus increasing the risk of infection by bunch-rotting fungi such as Botrytis.

In general, for a given variety and region, the best wines will come from balanced vines that ripen early rather than late.

How to assess ripening patterns

To predict ripening patterns, the best correlations exist for a range of vine development measurements taken between flowering and maturity. A 'diary of ripening' should be kept to record the timing of major vine development stages, notable weather events and other occurrences such as spray/nutrient application dates.

In order to influence the rate of ripening towards desired outcomes, it is vital to make any necessary changes to viticultural practices as early as possible to impact on the relevant ripening processes. For example, bunch thinning just a few weeks before harvest is unlikely to have any effect on the rate of ripening.

Berry measurements

Measure berry weights from 4 weeks after fruit set. This is important for yield prediction.

Remember that the effects of a lack of water, e.g. due to application of regulated deficit irrigation (RDI) after fruit set, will irreversibly reduce berry weight. When developing an irrigation strategy, the final berry size target must be taken into consideration because very small berries are not desirable for every wine style, and they may have very little juice.

Examine canes

Canes that are not lignified at veraison may indicate vine imbalance and delayed maturity.

Measure acid depletion

Measure the rate of acid decline from veraison, as this is generally a good indicator of the stages of the ripening process.

Record GDD/GDH

Produce your own growing season day degree days (GDD) or degree hours (GDH) records for each site. If growing degree hours between 15-30°C are recorded, a good estimate of ripening speed for bunches can be obtained.

Managing ripening rates

To avoid slow ripening:

- Choose rootstocks with low to moderate vigour on rich soils to ensure vines do not become over-vigorous;
- Manage vine balance: over-cropping slows ripening due, and over vigorous vines will have shaded bunches which also slows ripening;
- Apply vineyard floor management practices that encourage warm soils in cool climates. Soil characteristics in combination with nutrient inputs and availability affect root system development and thus the vine's water and mineral uptake;
- Maximise warmth in the bunch zone in cool climates or seasons, e.g. a highly reflective soil surface increases the reflection of light and heat into the bunch zone;
- Avoid accumulation of excessive heat loads in the bunch zone. This can be achieved by maintaining a single leaf layer over bunches particularly on the west side of rows. Row orientation and spacing of rows can also influence airflow and thus temperatures in the bunch zone;

- Ensure optimum soil water levels. Vines need little water compared with some other crops, but regular supply is advantageous for berry development. Avoid over watering as this encourages shoot vigour on many sites and thus causes slow ripening;
- Provide the required types and levels of nutrients. Monitor berry juice for indications of nutrient imbalances in fruit, e.g. excess potassium. Supplying vines with excess nitrogen (generally above 30-50 kg/ha) in combination with sufficient water supply will induce vigour and slow maturation; however, decreasing the supply of water can counterbalance the effect of high available nitrogen;
- Control pests and diseases as they may delay ripening by disturbing berry physiology. Injured berries produce defense compounds which can utilise large amounts of energy.

To avoid extremely fast ripening:

- Avoid low crop loads such that vines are un-balanced;
- Ensure absence of severe water stress. There is a fine balance between the induction of ripening by a slight water deficit and the level of water stress which causes vines to go into 'emergency ripening' mode. This is the vine's defense strategy to avoid crop loss (and thus its chance for reproduction) during periods of drought. The fast rate of ripening under such conditions results in low quality attributes in berries;
- Ensure adequate nutrition to enable optimal synthesis of enzymes and other compounds which influence fruit quality;
- Protect bunches from excessive heat load as these conditions intensify water loss and berry shrivel. Under such conditions, some varieties interrupt the import of water into berries at a late stage of ripening, so that evaporation from the berry continues and berries shrivel on the bunch (this is often observed for Shiraz). This process increases the concentration of sugar per gram of berry weight but not per berry. It may also intensify aroma characteristics due to the concentration of substances per kg of fruit, but excess heat and light exposure can degrade aroma and colour compounds.

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Further information

Useful references:

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